

REGION II START V  
DELIVERABLE SIGN-OFF SHEET

**SITE:** Canadian Radium and Uranium  
**TD No.:** TO-0032-0030  
**TASK No.:** 1030  
**TITLE:** Removal Assessment Sampling Report  
**DC No.:** STARTV-01-D-0070

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SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM V  
EPA CONTRACT NO.: 68HE0319D0004

March 12, 2020

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**EPA CONTRACT No: 68HE0319D0004**

**TD No: TO-0032-0030**

**DC No: STARTV-01-D-0070**

**SUBJECT: REMOVAL ASSESSMENT SAMPLING REPORT,  
CANADIAN RADIUM AND URANIUM SITE,  
MOUNT KISCO, WESTCHESTER COUNTY, NEW YORK**

Dear Mr. Gaughan,

Enclosed please find the Removal Assessment Sampling Report which summarizes the radon and soil sampling activities conducted by the U.S. Environmental Agency, Region II (EPA) with the support of Weston Solutions, Inc., Superfund Technical Assessment & Response Team V (START V) at an area of concern (AOC) located in proximity to the Canadian Radium and Uranium Site in Mount Kisco, Westchester County, New York. The sampling event was performed at the AOC on September 8 through 11, 2019.

If you have any questions or comments, please contact me at (732) 585-4413.

Sincerely,

WESTON SOLUTIONS, INC.

Bernard Nwosu  
START V Site Project Manager

Enclosure  
cc: TD File: TO-0032-0030

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On-Site Environmental, Inc., and Sovereign Consulting, Inc.

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## **REMOVAL ASSESSMENT SAMPLING REPORT**

### **CANADIAN RADIUM AND URANIUM** Mount Kisco, Westchester County, New York

Site Code: A23P  
CERCLIS Code: NYD987001468

Prepared by:

Superfund Technical Assessment & Response Team V  
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March 2020

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## **1.0 Introduction**

The U.S. Environmental Protection Agency, Region II (EPA) Superfund and Emergency Management Division (SEMD) with the support of Weston Solutions, Inc., Superfund Technical Assessment & Response Team V (START V) performed Removal Assessment activities on September 8 through 11, 2019 at an area of concern (AOC) located adjacent to the Canadian Radium and Uranium Site (the Site) in Mount Kisco, New York. Exterior, non-intrusive ground radiological survey and radon and soil sampling for laboratory analysis were conducted at the AOC as part of the Removal Assessment activities.

### **1.1 Site Location and Description**

The former Canadian Radium and Uranium (CRU) facility is located to the east of Kisco Avenue and to the west of railroad tracks in the Village of Mount Kisco, Westchester County, New York, in a primarily suburban residential and commercial area. The historic property on the Site is 2.72 acres and includes the 103 Kisco Avenue property currently occupied by a landscaping business and the 105 Kisco Avenue property previously occupied by a stone, masonry and landscaping business which is currently closed, and the property is now vacant. The Site is bounded by Kisco Avenue to the west, southwest, and northwest; railroad tracks to the south, east, and northeast; and a large, privately-owned warehouse to the north and northeast.

The focus AOC for this Removal Assessment event is a commercial property located at 125 Kisco Avenue (designated as Property C008). Property C008 is currently occupied by a car dealership. The single building located on Property C008 comprises of office spaces on the first and second floors and adjoining vehicle service garage on the east side of the building. Parking areas on Property C008 are located north of the building. The southern portion of Property P008 and the northern portion of the Site (Property C003) share a common perimeter fence.

Refer to Attachment A, Figure 1: Site Location Map and Figure 4: Property C008 Soil Sample Location Map.

### **1.2 Site History and Background**

From 1943 until approximately 1966, the CRU facility operations included the recovery of uranium and other radioactive elements from uranium-bearing sludge, old instrumentation, and watch dials. The work at the CRU facility is possibly associated with the federal government's Manhattan Engineering District (Manhattan Project). From 1943 to the 1950s, the primary product of the CRU facility was uranium; subsequently, radium became the principal product until the facility's closure. According to a Village of Mount Kisco memorandum, in 1957, CRU pleaded guilty to charges of allowing three employees to be overexposed to radiation. From March 5, 1958, until sometime after May 19, 1961, decontamination procedures and expectations were established for the CRU facility.

In November and December 1966, the facility buildings (a two-story concrete block building and two smaller one-story concrete block buildings) were decontaminated and demolished. Removal of radioactive dirt to a depth of 12 inches was required on the CRU premises. The most contaminated demolition materials were disposed of by Nuclear Diagnostic Laboratories located

in Peekskill, New York, while the less contaminated materials were disposed of at Croton Point Sanitary Landfill located in Croton-on-Hudson, New York. After decontamination and demolition, a post-operation survey was conducted by Isotopes, Inc. Two locations on the Haggerty Millwork wall, which originally shared a wall with the former CRU facility that was demolished during the 1966 decontamination and demolition process, were found above specifications. One contaminated location was removed by chiseling out the masonry of a wall. The second was a result of tailings from a leaking waste drum which CRU had stored on the second floor fire escape. Since contamination was low here, the area was sealed with 1 to 2 inches of mortar. Railroad Avenue was constructed where the main CRU building once stood and was put in place by the urban renewal efforts in the area. Between 1964 (pre-decontamination/demolition) and 1971 (post-decontamination/demolition), the building layout of the former CRU facility completely changed, and it is believed that none of the original CRU facility buildings remained after 1971.

On April 5, 1979, a local newspaper reported the 1957 death of the CRU plant manager due to leukemia from high radioactivity levels found in his body. On April 20, 1979, a survey was performed by the Assistant Commissioner of Health for Environmental Quality, Westchester Department of Health. Based on the surveys, the highest dose rates were found in a small portion of a locked, chain-link fenced area south of the old wood freight station on Railroad Avenue and east of the L. B. Richard's Lumber yard (*i.e.*, an area located adjacent to the railroad). All other elevated dose rates were found in areas covered by soil and vegetative growth. The 1979 investigation reported that the high readings were obtained from an area covering approximately one square yard (sq. yd.) of the property in an area not used by the public. In addition, the report indicated that the dose rates found did not pose a public health hazard to persons passing the fenced area, to persons working in buildings adjacent to the area, or to persons living across the railroad tracks to the east.

In a memorandum dated February 7, 1980, the Westchester County Health Department described investigation findings in more detail. The area in question was approximately 78 feet by 60 feet, enclosed by a chain-link fence located between the railroad tracks and a concrete paved area. The most significant contaminated area was a strip 15 feet by 5 feet, containing two separate "hot spots". A surface reading using an alpha probe survey meter measured 50 disintegrations per minute (dpm). Elevated readings several times above background were reported for an area extending about 50 feet south from the chain-link fence. The memorandum stated that the origin of this contamination was unknown and that it was not discovered in previous surveys.

In September 1993, the Bureau of Environmental Radiation Protection of the New York State Department of Health (NYSDOH) completed a survey of the Site; indoor radon measurements were collected (*i.e.*, office, show room, storage/sale floor) which documented a maximum concentration of 9.8 picocuries per liter (pCi/L), and the average of the different detectors was about 8.1 pCi/L. The NYSDOH also identified two outdoor areas where presence of radioactive materials were indicated at the back of Richard's Lumber, and the road that runs next to the railroad tracks and adjacent to a fence post inside the fenced portion of what appeared to be Richard's Lumber property on the south side of Railroad Avenue.

In 1994, the U.S. Environmental Protection Agency (EPA) conducted an on-site inspection to measure radon levels, collect air and soil samples, and measure radiation exposure rates. The purpose of the investigation was to determine if conditions required immediate action and if the

Site was eligible for long-term remediation under the federal Superfund Program. Elevated exposure rate measurements were documented on both the northern (10–700 microrentgens per hour [ $\mu\text{R/hr}$ ]) and southern (10–240  $\mu\text{R/hr}$ ) portions of the Site. Radium (Ra)-226 concentrations in soil samples taken from the top 1.5 feet ranged from 3 to 150 picocuries per gram (pCi/g). All of the radon measurements were below EPA's guideline (*i.e.*, 4 pCi/L) and the air samples collected at the Site did not indicate any radioactive contamination.

In July 1998, a complete radiological survey of the Village of Mt. Kisco and Richard's Lumber (former CRU) was conducted by the New York State Department of Environmental Conservation (NYSDEC). The property owned by the Village of Mount Kisco (103 Kisco Avenue) was found to have contamination over one large unpaved area [approximately 4,000 to 5,000 square feet ( $\text{ft}^2$ )] and a few smaller areas. The 1998 report stated that on the Mt. Kisco property, the highest concentrations of radium observed were a few hundred pCi/g and that most of the contamination was in the top 1 foot of soil. The report stated that the distribution suggests that uranium-containing material was placed on the surface and then the area was leveled. A new road (Railroad Avenue) had been built where the CRU facility once stood; soil sampling completed near the road showed elevated concentration of radium a few feet below the surface. The NYSDEC reported that the distribution of radioactive material near the road appeared to be consistent with movement of soil as part of the building demolition and subsequent construction of the road. Sampling beneath the road surface was not performed. There is no documentation of shielding or other control measures implemented on the 103 Kisco Avenue property, though current conditions suggest that the property had been recently paved with asphalt (of an unknown thickness) or other cover materials.

The 1998 report further stated that the survey of the Richard's Lumber (105 Kisco Avenue) property indicated that radioactive materials were present under the parking lot, but no samples were taken beneath the asphalt. The highest concentration of radium at the Site was found just north of Railroad Avenue (approximately 6,000 pCi/g). A large part of the main outside storage area was reported to be contaminated with radium near the surface as well as within some soil profiles to depths of approximately 4 feet. Survey data suggested that the contamination stopped abruptly at the edges of the paved areas. Railroad Avenue showed count rates that were lower than background soils; NYSDEC attributed these results to absorption by the road surface material (*i.e.*, shielding). The July 1998 report indicated that radiation doses to workers or visitors to the Site as it was being used at the time were not significant. The Site location where the dose rate was highest was a small area near Richard's Lumber, just north of Railroad Avenue. Time spent at this location was small; therefore, the accumulated dose was also estimated to be small. The July 1998 report suggested that significant radium contamination was present on both Mt. Kisco and Richard's Lumber properties. The NYSDEC did not consider the Site to be fully characterized at the completion of the survey.

In September 2013, Weston Solutions, Inc., Site Assessment Team (SAT), performed an on-site reconnaissance and gamma radiation screening of the historic CRU property and other suspected areas of contamination. Background readings taken north and northeast of the Site in the right-of-way (ROW) area alongside Kisco Avenue showed background gamma radiation levels of approximately 7,500 counts per minute (cpm). The highest reading of 73,637 cpm was located on the 105 Kisco Avenue property. Most readings were below 2 times (2x) background. There were three areas with readings that exceeded 2x background, ranging from 30,000 cpm to 73,637 cpm.



All three areas above 2x background were located in the back portion of the 105 Kisco Avenue property, east of the historic CRU facility. No signs of ground discoloration were observed.

In November 2013, SAT advanced eight boreholes to depths of 10 feet at the Site for gamma screening and soil sample collection. Using a gamma scintillation meter (Ludlum 2221 Scaler Ratemeter), field gamma screening data collected during the sampling event documented the gamma exposure rates at 6-inch depth intervals vertically down each sample location borehole. The soil samples collected represented the highest levels of gamma radiation recorded for each borehole. The soil samples were analyzed for isotopic thorium (thorium (Th)-228, Th-230 and Th-232), isotopic uranium (uranium (U)-233/234, U-235/236 and U-238), Ra-226, and Ra-228. Analytical results from the sampling effort suggested that there was measureable residual contamination remaining at the Site.

In August 2015, EPA and Weston Solutions, Inc., Removal Support Team 3 (RST 3), currently START V, conducted an extensive Removal Assessment event at the Site, which included a ground radiological survey, radon and soil sampling at the Metropolitan Transit Authority (MTA), Milepost 136, 103 Kisco Avenue (Property C001), Hickory Homes and Properties, Inc., 103 Kisco Avenue (Property C002), and 105 Kisco Avenue (Property C003) which was occupied at the time by New York Stone and Building Supply. Ground radiological survey and soil sampling was conducted at an off-site background location (comprising a strip mall), 145-159 Kisco Avenue (Property C004). Background gamma readings were taken at the off-site background location using Ludlum-2241 equipped with a sodium iodide (NaI) 2x2 scintillator, fluke photoionization chamber (FPIC), and high pressure ion chamber (HPIC). Background gamma readings taken with each instrument were as follows: Ludlum-2241 (7,500 - 9,500 cpm), FPIC (9 - 12  $\mu$ R/hr at waist height and 11 - 13  $\mu$ R/hr at contact), and HPIC (8.9  $\mu$ R/hr). Gamma radiation measurements collected with the Ludlum-2241 were more than 2x background at six of the 11 soil sampling locations selected throughout the Site, with values ranging from 20,000 to 180,000 cpm. At Property C003, above-background gamma readings (12,000 to 15,000 cpm) were observed in the southeast corner of the warehouse located northeast on the property. Gamma measurements collected with the FPIC indicated above-background values ranging from 9 to 15  $\mu$ R/hr at waist level and 14 to 51  $\mu$ R/hr at contact in the Electrical Room of the main building, and from 14 to 16  $\mu$ R/hr at waist level and 9 to 15  $\mu$ R/hr at contact in the southeast corner of the warehouse located northeast on the property. Gamma measurements collected with the HPIC indicated above-background value of 14  $\mu$ R/hr in the Electrical Room of Property C003 and at six of the 11 soil sampling locations throughout the Site, with values ranging from 14.6 to 36  $\mu$ R/hr. Radon/thoron measurements collected with RAD7 radon/thoron detectors did not indicate any elevated readings in exterior on-site locations.

On August 3 through 7, 2015, RST 3 procured the services of a National Radon Proficiency Program (NRPP)-certified company to conducted pre-mitigation radon sampling in all the on-site buildings at Properties C001 through C003. Passive activated charcoal canisters (radon canisters) were used to conduct short-term radon sampling tests that lasted a minimum of approximately 72 hours. Radon testing locations were focused on frequently occupied spaces in each on-site building. Bathrooms, kitchens, utility closets, and hallways were not tested to avoid biased results. Analytical results were compared with EPA Site-Specific Action Level of 4.0 pCi/L for radon. Based on the analytical results, radon concentrations did not exceed the EPA Site-Specific Action Level in any living spaces sampled at Properties C001 and C002. However, in Property C003,

analytical results indicated radon concentrations above the EPA Site-Specific Action Level in 11 of the 13 samples, including one duplicate, collected from the main building, with concentrations ranging from 0.6 to 19.5 pCi/L. In addition, analytical results exceeded the EPA Site-Specific Action Level in two samples collected from the southeast corner of the warehouse located on the far northeast portion of Property C003, with concentration ranging from 2.6 to 5.2 pCi/L. Based on the analytical results from the August 2015 radon sampling event, in October 2015, a radon mitigation system was installed in the main building of Property C003 by the owners, following which a post-remedial radon sampling event was conducted by EPA and RST 3. Analytical results indicated radon concentrations below the EPA Site-Specific Action Level throughout the living spaces in the main building of Property C003.

During the August 2015 event, RST 3 collected a total of 13 soil samples, including two field duplicates, from 11 soil borings advanced to depths 4 feet bgs throughout the Site. Soil samples were collected from the interval exhibiting the highest level of gamma radiation (based on Ludlum-2241 screening data) and/or where a fill layer was observed and/or at the discretion of the EPA On-Scene Coordinator (OSC). The sampling event was conducted in order to verify the presence of residual contamination and potential releases of radiation-containing material in soil associated with the former CRU facility. The soil samples were submitted for laboratory analyses of isotopic thorium, isotopic uranium, and other alpha emitting actinides via alpha spectroscopy Health and Safety Laboratory (HASL)-300 Method A-01-R; Ra-226 (21-day ingrowth), Ra-228, and other gamma emitting radioisotopes via gamma spectroscopy EPA Method GA-01-R; and target analyte (TAL) metals, including mercury. Analytical results indicated that concentrations of Ra-226 exceeded the EPA Site-Specific Action Level (dated August 2015) of 4.06 pCi/g in two of the four soil samples collected from Property C002. Exceedance of Ra-226 in Property C002 was highest at 0 to 36 inches bgs with a concentration of 10.4 J (estimated concentration) pCi/g. Ra-226 was also detected above the EPA Site-Specific Action Level in all four soil samples, including one field duplicate, collected from Property C003. Exceedance of Ra-226 was highest at 0 to 24 inches bgs with a concentration of 129 J pCi/g. Lead concentration was above the EPA Removal Management Level (RML) of 400 milligrams per kilogram (mg/kg) in one soil sample with a concentration of 510 mg/kg. Although no Site-Specific Action Level was provided by EPA for the aqueous (rinsate) samples, based on the analytical results, radioisotope concentrations were generally, not detected.

In April 2016, RST 3 collected a total of 103 soil samples, including five field duplicates, from 20 soil borings at every 6-inch interval up to 4 feet bgs in 15 locations and up to 8 feet bgs in five locations throughout the Site. The sampling event was conducted to identify additional source areas of radiological material at the Site. The soil samples were submitted for laboratory analyses of isotopic thorium, isotopic uranium, and other alpha emitting actinides via alpha spectroscopy HASL-300 Method U-02, Ra-226 (21-day ingrowth), Ra-228, and other gamma emitting radioisotopes via gamma spectroscopy EPA Method 901.1. Analytical results indicated that concentrations of Ra-226 exceeded the EPA Site-Specific Action Level (revised April 2016) of 2.52 pCi/g in eight of the 25 soil samples collected from three locations at Property C002. Exceedance of Ra-226 ranged from 2.57 pCi/g to 89.39 pCi/g at 24 to 36 inches bgs. The concentration of Ra-226 was below the EPA Site-Specific Action Level in soil samples collected 0 to 12 inches bgs at all three soil sample locations. Analytical results indicated exceedance of Ra-226 above the EPA Site-Specific Action Level of 2.52 pCi/g in 32 of the 71 soil samples collected from 16 locations at Property C003. Exceedance of Ra-226 ranged from 2.79 pCi/g at

12 to 24 inches bgs to 926.1 pCi/g at 36 to 48 inches bgs. The concentration of Ra-226 was below the EPA Site-Specific Action Level in soil samples collected 0 to 12 inches bgs in 15 of the 16 soil sample locations.

In June 2016, EPA and the Department of Energy (DOE) independently conducted aerial overflights of the Site to determine the possibility of lateral spread of the radiation contamination. The DOE overflight indicated potential lateral spread to the west of the Site along Kisco Avenue. The EPA overflight indicated two other potential areas of interest. One area was located immediately southeast of the Site off North Moger Avenue and the second approximately one half mile southwest of the Site located within the parking lot of Diplomat Towers (a residential condominium complex).

On December 12, 2016, EPA and RST 3 performed a non-intrusive ground radiological survey of the two new areas of interest to verify if the prior aerial overflight information generated by EPA and DOE were accurate. The areas within the parking lot of the Diplomat Towers and the parking lot immediately adjacent to the Site on the eastern side of the railroad tracks and fronting on North Moger Avenue were surveyed. Background gamma readings ranged from 17 to 20 kilo counts per minute (kepm). Based on the results of the ground radiological survey, gamma readings did not exceed 30 kepm in both areas of interest, which is below 2x background.

## 2.0 Scope of Work

START V was tasked by EPA with providing Removal Assessment support for a non-intrusive ground radiological survey and radon and soil sampling at Property C008. The objective of the survey and sampling activities was to verify if there are radiation source areas on Property C008 which may be attributable to the Site. START V was responsible for: procuring the services of a NRPP-certified company to conduct radon sampling; procuring a subcontractor to provide Geoprobe® drilling services for advancing soil borings; collecting, field-screening and shipping the soil samples to the assigned laboratory for analysis; documenting all Site activities in the Site logbook and with photographs; and documenting all soil boring locations with Global Positioning System (GPS) technology.

**Commented [GD1]:** Add in something about gpr survey subsurface Markout abilities

## 3.0 On-Site Personnel

Name	Affiliation	Duties On-site
Daniel Gaughan	EPA, Region II	On-Scene Coordinator
David Kappelman	EPA, ERT	Ground Radiological Survey
Michael Hoppe	EPA, ERT	Ground Radiological Survey
Bernard Nwosu	Weston Solutions, Inc. START V, Region II	Site Project Manager, Site H&S, Site QA/QC, Sample Collection, and Sample Management
Michael Lang	Weston Solutions, Inc. START V, Region II	Sample Collection and Sample Management
Tom Wysocki	Environmental Field Services, Inc.	GPR and Geoprobe® Operation
Andreas Andreou	Precision Environmental, Inc	Radon Sampling

EPA: U.S. Environmental Protection Agency  
ERT: Environmental Response Team  
QA/QC: Quality Assurance/Quality Control

START V: Superfund Technical Assessment & Response Team V  
GPR: Ground Penetrating Radar  
H&S: Health and Safety

#### 4.0 Site Activities and Observations

Prior to mobilizing to the Site, the START V drilling subcontractor, Environmental Field Services, Inc. (EFS), contacted Dig Safely New York and requested subsurface utilities mark out of the existing underground public utilities located on Property C008 and within the ROW areas adjacent to the overall AOC. On September 8, 2019, the EPA OSC, personnel from EPA's Environmental Response Team (ERT), and START V mobilized to Property C008 and initiated Removal Assessment activities on the same day.

Utilizing a combination of the RSX1 system which comprised of a 4x4x16 NaI scintillator connected to the RadAssist Software and two sets of Ludlum-2241s and 3x3 NaI scintillators connected to EPA's VIPER system (a wireless network-based communication system), ERT performed non-intrusive radiological survey throughout exterior areas of Property C008 including the parking areas and locations between the ROW area and the fenced property boundary between Property C008 and the Site.

On September 8, 2019, a total of 18 radon canisters were deployed by personnel from the NRPP-certified company, Precision Environmental, Inc. (PEI), at locations within the single building, including the first and second floor office spaces and work areas in the adjoining vehicle service garage.

**Commented [GD2]:** Is it 18? I only count 17 in the figures and on the data table.

On September 8 and 9, 2019, EFS utilized Geoprobe® technology to advance nine soil borings at locations selected by the EPA OSC on Property C008. Prior to advancing any borings, EFS performed subsurface utilities mark-out around the selected soil boring locations using Ground Penetrating Radar (GPR). START V collected a total of 19 soil samples, including one field duplicate, from the soil boring locations, and a rinsate blank was collected each day of the soil sampling event. The characteristics of the soils extracted from each boring location was documented in a boring log prior to sampling sample collection. All the soil and rinsate samples were shipped via FedEx on September 10, 2019 to the assigned laboratory for analysis.

On September 11, 2019, EPA, START V, and PEI returned to Property C008 to pick up the radon canisters that were deployed on September 8, 2019. A total of 17 radon canister samples, including two field duplicates (co-located samples) and one field blank, were picked up by PEI and submitted to the assigned PEI-procured laboratory for analysis.

**Commented [GD3]:** See previous comment about number of canisters. Correct throughout report.

Refer to Attachment B, Table 2: Soil Sample Collection and Boring Log Summary Table and Attachment C: Photographic Documentation Log.

#### 5.0 Radiological Survey and Sampling Methodology

All field activities including ground radiological survey and radon and soil sampling were performed in accordance with the START V Site-specific Health and Safety Plan (HASP). All sampling activities were performed in accordance with the START V Site-specific Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) and EPA's ERT/Scientific, Engineering, Response and Analytical Services (SERAS) contractor's Standard Operating Procedure (SOP) Number (No.) 2001: *General Field Sampling Guidelines*. The following summary describes the methodologies utilized for the ground radiological survey and radon and soil sampling during the Removal Assessment event.

## 5.1 Radiological Survey

The radiological survey was performed using a combination of two setups that were secured on a hand cart for mobility. One setup comprised of two sets of Ludlum-2241s and NaI 3x3 scintillators and the second setup comprised of the RSX1 system which includes a 4x4x16 NaI system. Each Ludlum-2241 setup comprised of a NaI 3x3 scintillator, Life-line Interoperable Network Communicator (LINC), and Trimble® GPS. A Gateway (internet source) along with both Ludlum-2241 setups were secured on the hand cart, and a hand-held iPad tablet was utilized to monitor the survey readings. The LINC, GPS units and iPad tablet were connected to the internet via the Gateway. One Ludlum-2241 setup displayed gamma readings in  $\mu\text{R/hr}$  and second Ludlum-2241 setup displayed gamma readings in cpm. The gamma readings were transmitted from the Ludlum-2241 units through the LINC via the Gateway to the VIPER system which provided instantaneous gamma readings through a computer server (Viper Deployment Manager [VDM]). The GPS units provided geographical references of the gamma readings by transmitting locational data of the Ludlum-2241 setups through the Gateway and VIPER to VDM. The instantaneous gamma readings as well as with the geographical locations were viewed online on the VDM webpage via the iPad tablet. The RSX1 system comprised of a 4x4x16 NaI system that was connected to the RadAssist Software to provide more accurate survey data. With the combination of both survey instrumentation setups and the mobility provided by securing all the survey instruments on the hand cart, ERT conducted non-intrusive gamma survey along predetermined paths throughout exterior areas of Property C008 including the parking areas and areas adjacent to the ROW areas.

## 5.2 Radon Sampling

In accordance with the guidelines presented in the American National Standards Institute (ANSI)/American Association of Radon Scientists and Technologists (AARST) *Protocol for Conducting Radon and Radon Decay Product Measurements in Multifamily Buildings* (MAMF 2012) and as directed by the EPA OSC, the START V-procured, NRPP-certified company, PEI, provided field support for identifying radon canister placement locations in living spaces of the on-site office and service garage building, placing the canisters, picking up the canisters, and delivering to the assigned laboratory for radon analysis. Passive activated charcoal canisters (radon canisters) were utilized to conduct short-term radon sampling tests that lasted a minimum of approximately 72 hours. Weather information including, temperature, humidity, wind speed and direction, and barometric pressure were documented during canister deployment and pickup. Radon testing locations were focused on frequently occupied spaces on the first and second floors of the one office building and the adjoining vehicle service garage situated on the property. Bathrooms, kitchens, utility closets, and hallways were not tested to avoid biased results. The canisters were raised no less than approximately 20 inches above the ground and, where possible, away from draft and vents. When the protective covering of the canister inlet surface was peeled off, ambient air was allowed to collect in the canisters for a minimum of approximately 72 hours at each location. The radon samples were collected for definitive data and quality assurance/quality control (QA/QC) objectives.

## 5.3 Soil Sampling

Soil sampling was performed in accordance with EPA's ERT/SERAS contractor's SOP No. 2012: *Soil Sampling*. Prior to initiating any intrusive site activities (*i.e.*, drilling) START V verified that

Dig Safely New York had completed the subsurface utilities mark-out requested by EFS. Following the completion of ground radiological survey throughout the AOC, the OSC reviewed the data and conferred with ERT representatives and determined a soil sampling approach to investigate elevated survey results and cover the entire AOC which included which did not indicate any locations with radioactivity measurements significantly above background. The EPA OSC randomly identified and flagged nine soil boring locations. Consequently, EFS utilized GPR to perform subsurface utilities mark-out around all the proposed soil boring locations prior to advancing soil borings with Geoprobe®.

In accordance with EPA's ERT/SERAS SOP 2050: *Geoprobe Operation*, soil borings were advanced to depths bgs using Direct-Push sampling method and Macro-Core sampler. The soil cores extracted from each soil boring were screened at every 6-inch interval for gamma radiation using a Ludlum-2241 and NaI 3x3 scintillator. At least two soil samples were collected from each soil core at the intervals that exhibited the highest gamma readings and/or where a fill layer was observed and/or at the discretion of the EPA OSC. The characteristics of the soils in each core was documented prior to sample collection. Soil samples were collected in re-sealable plastic bags using dedicated, disposable plastic scoops. The soil samples were homogenized in the plastic bags prior to being transferred into 32 ounce (oz) plastic sample jars. After sampling, the boring locations were restored by backfilling the bore holes in reverse order with the extracted soil in the cores, tamped down, and sealed with topsoil. The soil samples were collected for definitive data and QA/QC objectives. A total of 19 soil samples, including QA/QC samples, were collected.

Decontamination of non-dedicated sampling equipment (i.e. Geoprobe® cutting shoe) was performed in accordance with EPA's ERT/SERAS SOP No. 2006: *Sample Equipment Decontamination* and included Alconox detergent and potable water scrub, potable water rinse, deionized (DI) water rinse, isopropyl alcohol rinse, DI water rinse, steam clean, and air dry. One rinsate blank was collected in 4x1 liter (L) plastic bottles (preserved with nitric acid to pH less than 2) at the end of each day of sampling to demonstrate adequacy of the decontamination of non-dedicated sampling equipment. All sample information were entered into the EPA Scribe database from which sample labels and chain of custody (COC) record was generated. The sample labels were affixed to the sample jars and containers, which were stored in a cooler.

## 6.0 Laboratories Receiving Samples

The following laboratories were utilized for sample analysis during the September 2019 Removal Assessment sampling event:

Laboratory	Sample Matrix	Analyses
Radon Testing Corporation of America (RTCA) 2 Hayes Street Elmsford, New York 10523	Air	Radon

Laboratory	Sample Matrix	Analyses
National Analytical Radiation Environmental Laboratory (NAREL) 540 South Morris Avenue, Montgomery, AL 36115	Soil/Aqueous	Alpha Spectroscopy/Isotopic thorium (Th-227, Th-228, Th-230, Th-232) Alpha Spectroscopy/Isotopic uranium (U-234, U-235, U-238) Gamma Spectroscopy (Bi-212, Bi-214, Cs-137, Eu-155, K-40, Pb-210, Pb- 212, Pb-214, Ra-226, Ra-228, Th-234, Tl-208, U-235) Ra-226 and Ra-228 via 21-day ingrowth

## 7.0 Sample Collection and Dispatch

On September 8 and 9, 2019, START V collected a total of 19 soil samples, including one field duplicate, and two rinsate blanks from Property C008. On September 10, 2019, all 19 soil samples, including the one field duplicate, and two rinsate blanks were documented under COC record No. 2-090919-0032-0030-0001 and shipped via FedEx Airbill No. 7761-9080-7836 to National Analytical Radiation Environmental Laboratory (NAREL) located in Montgomery, Alabama for analyses including isotopic thorium (Th-227, Th-228, Th-230, Th-232) and isotopic uranium (U-234, U-235, U-238) via alpha spectroscopy, other gamma emitting isotopes (Bi-207, Bi-212, Bi-214, Cs-137, Eu-155, K-40, Pb-210, Pb-212, Pb-214, Ra-226, Ra-228, Th-234, Tl-208, U-235) via gamma spectroscopy, and Ra-226 and Ra-228 via 21-day ingrowth method.

On September 11, 2019, START V subcontractor, PEI, collected a total of 18 radon canister samples, including two field duplicates, and one field blank, from Property C008. All the radon canister samples were shipped by PEI on the same day of collection to Radon Testing Corporation of America (RTCA) located in Elmsford, New York.

Refer to Attachment B, Table 1: Radon Sample Collection and Validated Analytical Results Summary Table, Table 2: Soil Sample Collection and Boring Log Summary Table, and Attachment D: Chain of Custody Record.

## 8.0 Radiological Survey Results

Based on the data generated by the three instrumentation setups utilized during the exterior ground radiological survey, background gamma levels ranged from 0 to 13 uR/hr (approximately 14 to 20 kcpm). Gamma radiation levels were mostly background in the parking areas and behind the building. The northeast corner of the property, as well as a small portion of the northwest building entrance and the east side of the building had slightly elevated gamma readings, approximately 2x background. One location between the ROW area and the fenced property boundary of Property C008 and the Site, had elevated gamma readings that were at least 3x background.

Refer to Attachment A, Figure 2: Gamma Survey Results Map

## 9.0 Analytical Results

The validated analytical results of the radon samples were compared with the EPA Site-Specific Action Level of 4 pCi/L and the validated analytical results of the soil samples were compared with the EPA Site-Specific Action Levels (revised April 2016).

## **9.1 Radon Analytical Results**

Based on validated analytical results, concentrations of radon were well below the EPA Site-Specific Action Level of 4.0 pCi/L in all 17 radon canister samples, including the field duplicate, collected from Property C008. Radon concentrations ranged from 0.2 pCi/L to 0.8 pCi/L.

Refer to Attachment A, Figure 3A: Property C008 First Floor Radon Sample Location Map, Figure 3B: Property C008 Second Floor Radon Sample Location Map, Figure 3C: Property C008 Service Garage Radon Sample Location Map, Attachment B, Table 1: Radon Sample Collection and Validated Analytical Results Summary Table, and Attachment E: Data Validation Report.

## **9.2 Soil Analytical Results**

Based on validated analytical results, concentrations of Ra-226 exceeded the EPA Site-Specific Action Level of 2.52 pCi/g in 10 of the 19 soil samples, including the one field duplicate, collected from Property C008.

Analytical results indicated exceedance concentrations of Ra-226 in: two of three soil samples collected at depths 24 to 36 inches bgs, two of three soil samples, including the field duplicate, collected at depths 36 to 48 inches bgs, three of four soil samples collected at depths 60 to 72 inches bgs, one of two soil samples collected at depths 72 to 84 inches bgs, and two soil samples collected at depths 84 to 96 inches bgs.

Exceedance concentrations of Ra-226 ranged from 2.63 pCi/g in C008-SB002-060072-01 collected at depths 60 to 72 inches bgs to 7.39 pCi/g in C008-SB007-024036-01 collected at depths 24 to 36 inches bgs. Analytical results did not indicate any exceedance concentrations of Ra-226 in soil samples collected at depth 0 to 24 inches, 48 to 60 inches, and 108 to 120 inches, bgs.

It is noteworthy that the two soil samples, C008-SB009-000012-01 and C008-SB009-072084-01, collected at C008-SB009, the location between the ROW area and the fenced property boundary of Property C008 and the Site, where elevated gamma readings were at least 3x background, did not indicate any exceedance concentrations of Ra-226.

Refer to Attachment A, Figure 5: Property C008 Soil Analytical Result Map (Radium -226 Only), Attachment B, Table 2: Soil Sample Collection and Boring Log Summary Table, Table 3: Validated Soil Analytical Results - Radioisotopes Summary Table, and Attachment E: Data Validation Report.

## **10.0 Conclusion**

On September 8 through 11, 2019, EPA, ERT and START V performed Removal Assessment activities at an AOC, Property C008, located in proximity to the Site. As part of the SOW, radiological survey and radon and soil sampling were conducted as part of the Removal Assessment activities.

A mobile, non-intrusive gamma survey was conducted along predetermined paths throughout exterior areas of Property C008 including the parking areas, and locations between the ROW area



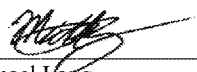
and the fenced property boundary between Property C008 and the Site. A total of 18 radon canister samples, including two field duplicates, and one field blank, were collected from locations on the first and second floor office spaces and the adjoining vehicle service garage of the single building situated on Property C008 and analyzed for radon. A total of 19 soil samples, including one field duplicate, were collected from nine soil borings advanced via Geoprobe® technology and analyzed by the assigned laboratory for isotopic thorium and isotopic uranium via alpha spectroscopy, other gamma emitting isotopes via gamma spectroscopy, and Ra-226 and Ra-228 via 21-day ingrowth method.

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Based on radiological survey data, background gamma levels ranged from 0 to 13 uR/hr (approximately 14 to 20 kepm. Gamma radiation levels were mostly background in the parking areas and behind the building. The northeast corner of the property, as well as a small portion of the northwest building entrance and the east side of the building had slightly elevated gamma readings, approximately 2x background. One location (C008-SB009) between the ROW area and the fenced property boundary of Property C008 and the Site, had elevated gamma readings that were at least 3x background.

Based on analytical results, radon concentrations were well below the EPA Site-Specific Action Level of 4 pCi/L. Analytical results of the radon samples were compared with the EPA Site-Specific Action Level of 4 pCi/L and analytical results of the soil samples were compared with the EPA Site-Specific Action Levels (revised April 2016). Based on analytical results, 10 of the 19 soil samples, including the one field duplicate, indicated concentrations of Ra-226 exceeding the EPA Site-Specific Action Level of 2.52 pCi/g. Exceedance concentrations of Ra-226 ranged from 2.63 pCi/g in C008-SB002-060072-01 collected at depths 60 to 72 inches bgs to 7.39 pCi/g in C008-SB007-024036-01 collected at depths 24 to 36 inches bgs. Based on analytical results, Ra-226 was not detected at concentrations exceeding the Site-Specific Action level in soil samples collected at depth 0 to 24 inches, 48 to 60 inches, and 108 to 120 inches, bgs. It is noteworthy that the two soil samples collected at depths 0 to 12 and 72 to 84 inches bgs from C008-SB009, did not indicate any exceedance concentrations of Ra-226 despite the elevated gamma readings of at least 3x background noted in this area.

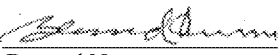
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